PROVANCHERIA

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Mémoires de l'Herbier Louis-Marie

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FLORA
OF THE
PRAIRIE PROVINCES

A HANDBOOK
TO THE FLORA OF THE PROVINCES OF
MANITOBA, SASKATCHEWAN AND ALBERTA

by

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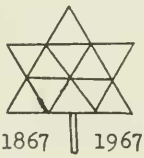


Part I

Pteroids, Ferns, Conifers and

Woody Dicopsids

PREFACE

We are pleased to present herewith in this condensed form a survey of the flora of Manitoba, Saskatchewan and Alberta as we know it. It is in a form which we hope will be especially adapted to use by the college student, yet remains convenient, in form and presentation, for use not only by the educated layman who my wish a key to the nature around him, but also by biologists, agreps, botanists and other naturalists who may have the need for a handy guide to the vegetation of our area.

ENGLISH POPULAR NAMES have been restricted to those that appear to be vernacular and they are underlined only if they are known to be vernacular in Canada. FRENCH POPULAR NAMES follow in (brackets) and are underlined only if known to be vernacular in North America.

NATIVE AND INTRODUCED plants are distinguished as follows: names underundulated represent plants native in our area; names in CAPITALS represent plants introduced in our area.

SYNONYMY. Synonyms have been kept to the minimum necessary to establish the relation between this volume and the more important floras having a bearing in our region. The main ones considered are as follows: H.B. SPOTTON, A. COSENS and T.J. IVEY, Wild Plants of Canada, 1948; M.L. FERNALD, Gray's Manual of Botany 1950; H.A. GLEASON, New Britton and Brown Illustrated Flora, 3 vols, 1952; C.L. HITCHCOCK, A. CRONQUIST, M. OWNBEY, J.W. THOMPSON, Vascular Plants of the Pacific Northwest, 5 vols (4 published to-date) 1955-64; A.C. BUDD & K.F. BEST, Wild Plants of the Canadian Prairies, 1964; H.J. SCOGGAN, Flora of Manitoba, 1957; R.C. RUSSELL, G.F. LEDINGHAM, R.T. COUPLAND, An Annotated List of the Plants of Saskatchewan, 1954; A.J. BREITUNG, Annotated Catalogue of the Vascular Flora of Saskatchewan, 1957; E.H. MOSS, Flora of Alberta, 1959.

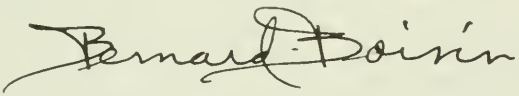
Two kinds of synonyms have been distinguished. True synonyms, such as Astragalus triphyllus Pursh in the synonymy of A. gilviflorus Sheldon, are followed by the correct author's name. Other synonyms, such as Astragalus hypoglottis AA. in the synonymy of A. danicus Retz., represent names based on misidentification of specimens or misinterpretation of types; note that the author's name has therefore been replaced by the abbreviation AA. All synonyms are underlined and encased in (brackets).

The local DISTRIBUTION of each taxon is followed by its general distribution in an abbreviated form. The geographical sequence used conforms to the list of abbreviations below. Two geographical abbreviations are connected by a hyphen when a Canadian distribution is continuous across the intervening provinces or territories, while a coma separating geographical units indicates a discontinuous Canadian distribution. Thus Q-BC indicates that a plant is known to occur in Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia. Conversely Q-Man, Alta-BC indicates a plant with a similar distribution, but lacking in Saskatchewan.

A distribution is enclosed in (brackets) if we have not checked it personally but are quoting other botanists. No brackets are used when we have been able to confirm the distribution given herewith. Partially confirmed distributions are accordingly given partially outside, partially inside brackets. Prior to 1963 our recording of verified distributions was unfortunately somewhat spotty, hence some of the confirmed distributions will fall short of our actual herbarium studies and annotations.

A brief review of 22 major families and other groups of plants occurs at the beginning of the Herbaceous Dicots. This review may be especially useful to the beginner. It may also serve as an outline for a practical course in Plant Classification at the elementary level.

In so far as we have been able to check them, we have included in this text only such taxa as we have been able to recognize as discrete biological entities. All others have been relegated to synonymy, along with all minor morphological segregates that seemed of no particular significance. We have acted on the basis that first and foremost a species should be morphologically discontinuous from its closest relatives. And this discontinuity should be such as to be readily recognized by a good amateur or biologist (ecologist, forester, agrep, etc.), given the usual equipment and a reasonable amount of previous experience or training. One should not need to send for a specialist for every other Carex or Crataegus. Taxonomy is not an esoteric science, but an everyday tool of biologists, amateurs and just plain interested and intellectually curious people. We consider that the classification of Vascular Plants should remain within reach of such people and that the species should be the natural unit of knowledge. May we hope that the result of our efforts does not fall too far short of our objective.



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* A few additions and minor revisions have been incorporated to this text until late spring and summer 1967.

THANKS

Our field work in the Prairie Provinces cover 8 seasons from 1946 (with the National Museum) to 1960 (with the Department of Agriculture) and we have had an opportunity to examine or borrow a large proportion of the relevant material preserved in institutional collections. The general western collections at the Department of Agriculture (DAO) and at the National Museum (CAN) are rather complete and have been extensively reviewed. The general but less extensive collections at the Faculty of Agriculture at Laval (QFA) has also been reviewed nearly in full. Another extensive and important collection is preserved at the Gray Herbarium (HUH) but has been examined in part only. We have borrowed large blocks from some of the local herbaria, namely from the University of Saskatchewan,(SASK), the University of Regina, (REG), the Experimental Farm at Swift Current (SCS) and the Research Station at Saskatoon (SASKP). We have also leafed through part of the collections at the University of ALBERTA (ALTA), the University of Manitoba (WIN) and the Experimental Farm at Brandon. At one time or another we have received selected loans from a large number of institutions, including every one of the above. To all the institutions who have thus placed their facilities at our disposal, our most grateful thanks for their unfailing cooperation. We wish to extend similar thanks to the many colleagues who have helped us with information and suggestions and similarly to the numerous amateurs who have kept sending in a steady stream of information and of duplicates of their more important discoveries. Many of these amateurs have also published important papers and have thus made a major contribution of their own. Such are: A.J. Breitung (McKague, Cypress Hills, Waterton), Dr. G.H. Turner (Fort Saskatchewan), J.H. Hudson (Mortlach), and J.P. Bernard (Otterburne). The latter is now my assistant and deserves special thanks for his substantial contribution to the preparation of this text, collaborating on the preparation of the glossary, helping to check the distributions and, generally speaking, shouldering a large proportion of the tasks involved in preparing this manuscript for publication.

ABBREVIATIONS

AA. Authors, American Author.	K Keewatin District
sphalm. By mistake; abbreviation of the latin sphalmate.	Mack Mackenzie District
m Meter, about 4 inches longer than a yard.	Y Yukon
dm Decimeter; about 4 inches.	Aka Alaska
cm Centimeter; about 2/5 inch.	L Labrador
mm Millimeter; about 1/25 inch.	NF Newfoundland
ssp. Subspecies	SPM Saint-Pierre & Miquelon
var. Variety	NS Nova Scotia
f. Form	PEI Prince Edward Island
cv. Cultivar	NB New Brunswick
n North	Q Quebec
s South	O Ontario
e East	Man Manitoba
w West	S Saskatchewan
ne Northeast	Alta Alberta
nw Northwest	BC British Columbia
se Southeast	US United States of America
sw Southwest	CA Central America, (including Mexico and the West Indies)
c Central	SA South America
G Greenland	Eur Eurasia
F Franklin District	Afr Africa
	Oc Oceania

SEQUENCE OF FAMILIES AND GENERA

The sequences of FAMILIES is adapted from the Bull. Soc. Bot. Fr. 103: 490-505. 1956. And the sequence of GENERA within a family is adapted from Dalla Torre & Harms, Genera Siphonogamarum 1900-1907 for the Conifers and Flowering Plants, from E.B. Copeland, Genera Filicum 1947, for the Ferns.

At least as far as the families are concerned, the basic principle of the sequence is the following evolutionary hypothesis.

Evolution does not proceed by the creation or production of brand new structures -- evolution proceeds by fixation, modification, specialization, differentiation or reduction of preexisting structures. Structures which appear to be new, those which constitute a progress, those which give a species, or other taxon, a special advantage in the struggle for life, which enable a species to occupy a previously empty nichr or to displace an earlier occupant, such structures are always evolved step by step from preexisting structures.

This evolution step by step, or microbematic (=little steps) evolution, is familiar to our generation by many well known instances such as the creation of new horticultural varieties or the appearance of new and resistant races of pests and diseases following the wide application of a chemical or biological controls.

In practice this evolutionary concept leads to the following observations in so far as the Vascular Plants are concerned.

1- Free structures are more primitive than fused structures.

2- Similar structures are more primitive than differentiated structures.

3- The type with numerous parts is more primitive than one with fewer parts or with parts fixed in number, which in turn is more primitive than the type without the same parts, provided this absence is the result of reduction.

4- Alternate or spiral parts is a more primitive condition than opposite or verticillate, as the latter seems to result from some internodes failing to develop.

5- Open venation is more primitive than reticulate venation.

6- Indefinite and indetermine growth is more primitive than definite or determinate growth.

7- The terminal or solitary flower is more primitive than the inflorescence and the open inflorescence is more primitive than a closed inflorescence, such as a capitulum,cyathium, catkin, etc., which has come to function more or less as a single flower.

8- The free prothallium (alternation of generations) is a more primitive type than the type where the spores develop and produce a seed without leaving the mother-plant.

9- Dichotomous branching is more primitive than sympodial or monopodial or verticillate branching.

10- The type with scattered and similar sporophylls is more primitive than the type with sporophylls borne in a spike, or sexually differentiated, etc.

11- The type with the fronds all similar is more primitive than the type with the fronds differentiated into sterile and fertile ones.

12- Radial symmetry is generally more primitive than the dorsiventral or bilateral or zygmorphic type.

13- The perennial plant is more primitive than the biennial or the annual.

14- The woody plant is generally more primitive than its herbaceous relative.

15- The terrestrial and autonomous type is more primitive than its aquatic, or epiphytic, or saprophytic, or climbing, or parasitic, or symbiotic relative.

Finally, evolution tends to become irreversible as a type becomes further and further reduced, more and more specialized.

KEYS TO GENERA AND SPECIES

Keys are a modern feature of floras, but their development is a gradual one. In floras of two centuries ago there were no keys, but the species of a genus were often arranged in a graded sequence so that the successive diagnostic names could be used somewhat like an unindented key. Synoptical diagrams of the classification of a whole flora were often offered as a help to the user. Larger genera were often subdivided by means of subheadings. The latter were easy to locate in the text as they

were usually quite symetrical visually and may be further identified by use of various symbols such as asterisks, daggers, dashes, etc. As genera became larger, more elaborate system of subheadings were developed. And when these subheadings were brought together in a synoptic table at the beginning of a genus, a key was born. As keys were further developed, they tended to become dichotomous. And when ease in identification became the primary objective of a key, the natural key which gave a synoptical view of a genus tended to give way to the artificial key in which diagnostic characters are selected solely for their ease of use and efficiency in identification.

We have further developed and refined our keys along the lines of current trends. Our keys are purely artificial and built strictly as an aid to identification; more convenient characters are given the preference over more fundamental ones that might better illustrate the essential differences between taxa. Keys are strictly dichotomous and indented, with the pairs of indentations identified by the same letter in the margin. This is the type of structure which produces the easiest keys to use. The number of words and concepts used in each indentation has been kept low on purpose so that the reader may keep the contents of the first indentation clearly in mind while he reads the second indentation. Keys that are overloaded with ifs and whens or too many characters may be more accurate because they may take care of all the contigencies, but the gain in accurancy is all too often at the expense of comprehension.

Visual symetry is a valuable feature of a good key; it enables the eye to discover quickly and follow easily a particular path of identification. The visual symetry is here provided primarily by the use of indentations and identifying letters. This has freed us from the need for verbal symetry and we have therefore eliminated some of the repetitiveness usely found in the second member of a pair of indentations. The resulting brevity will facilitate the task of the mind trying to grasp simultaneously the contents of a pair of indentations. We have also been abled to emphasize the diagnostic differences in our keys at the expense of verbal symetry. Further we have often emphasized the direction of the differences between two taxa or two groups of taxa; it is thus quite often possible to state in only one or two words the essential nature of the difference between two entities.

As we progressed in the preparation of this text we noticed that is was possible to grasp an overall view of a key as long as its terms were not too numerous. This has led us to try to subdivide each larger genus into groups of mostly 6-10 species each. When a large key is thus broken in smaller units, it is possible to retain a overall view of the key to a much larger number of species or genera.

For the sake of brevity the characters used in a key are most often not repeated in descriptions of species, genera and larger groups. Further brevity has been achieved quite often by merely stating how a particular taxon differs from a closely

related one, thus obviating the need to repeat such characters as they may have in common. While a standard sequence is generally followed in describing the successive parts of a plant, more important features are often stated first, especially if they have strong diagnostic value, and especially if these characters were not used in the key.

FLORA OF THE PRAIRIE PROVINCES
Embranchement: TRACHAEOPHYTA

Plants with vascular tissues and, usually, recognizable root, stem and leaves.

a. Reproduction by spores borne on leaves or sporophylls.
  b. Sporangia borne dorsally on peltate sporophylls. Branches, leaves and sporophylls verticillate ..... Division 2. Equisophyta p. 14
  bb. No peltate sporophylls. Branches, leaves and sporophylls usually alternate.
    c. Sporangia ventral, leaves usually small and simple ..... Division 1. Lycophyta p. 9
    cc. Sporangia dorsal or naked on specialized branches; leaves (=fronds) usually large and variously divided. ..... Sub-division 1. Pterophytina p. 18
aa. Reproduction by seeds borne in cones or flowers.
  d. Seeds naked, borne in cones; woody plants with leaves usually persistent and mostly needle-like ..... Sub-division 2. Gymnophytina p. 32
  dd. Seeds wrapped in a carpel, borne in flowers, leaves various .... Sub-division 3. Angiophytina p. 39

Division 1. LYCOPHYTA

Sporangia solitary and subaxillary on the ventral side of a bract or leaf (=sporophyll).

a. Submerged tufted aquatics from a fleshy bilobed corm ..... Class 2. Isopsida p. 14
aa. Normally terrestrial herbs with clearly distinct stem (and branches) ..... Class 1. Lycopsida p. 9

Class 1. LYCOPSIDA

Growing point terminal. Foliar appendages differentiated into leaves and sporophylls, the latter usually disposed into clearly recognizable spikes.

a. Spike cylindrical; spores very small and quite numerous ..... 1. Lycopodiaceae
aa. Spike quadrangular, the sporophylls being disposed in 4 vertical rows; some of the spores much larger and only 4 to a sporangium .... 2. Selaginellaceae

Order 1. LYCOPODIALES

Single family

1. LYCOPODIACEAE (CLUB-MOSS FAMILY)

Sporangia, spores and prothallia not sexually differentiated. Sporangia and leaves without ligules.

1. LYCOPODIUM L.

Herbs dichotomously divided. Leaves small and simple, disposed on 4 ranks or more, persistent.

a. Bearing rings of bulblets. No spike ..... 1. L. Selago
aa. No bulbets. Sporophylls in a terminal spike.
b. No rhizome. Terminal spike barely differentiated from the foliage ..... 2. L. inundatum
bb. Elongated rhizomes present. Spikes strongly differentiated from the foliage.
c. Spike borne on a long peduncle.
d. Leaves in about 8 rows and with a long terminal seta ..... 4. L. clavatum
dd. Branchlets flattened; leaves partly adnate and in 4 rows ..... 8. L. complanatum
cc. Spikes sessile or nearly so.
e. Leaves in 6 or more rows, the free portion of each leaf 3 mm long or more.
f. Erect shoot with a strictly dichotomous branching; branches few ..... 3. L. annotinum
ff. Erect shoot with a distinct main stem; branches numerous .... 5. L. obscurum
ee. Leaves in 4-(5) rows, much adnate, the free portion not more than 3 mm long.
g. Leaves of the various rows quite similar ..... 6. L. sabinifolium
gg. Leaves strongly differentiated, those of the dorsal row trowel-shaped ..... 7. L. alpinum

1. L. Selago L. var. Selago -- Rat's Tail (Sélagine, Herbe aux porcs) -- No rhizome, but tufted. Strictly dichotomous with all branches reaching the same level. Rings of bulblets, sporophylls and leaves in alternating groups along the branches. Alpine and subarctic habitats, usually half buried in Sphagnuum. -- G, K-Aka, L-SPM, NS, NB-BC, US, (CA, SA), Eur -- F. appressum (Desv.) Gelert -- Leaves erect and tightly appressed to the stem. Hudson Bay region. -- G-Aka, L-SPM, NS, Q-nMan, swAltaseBC, (US), Eur.

The widely distributed var. Selago has the leaves ± 1 mm wide, or slightly more, and straight. Around the Pacific Ocean it grades into, and is largely replaced by, the more delicate var. Miyoshianum Makino with leaves ± 0.05 mm wide, ± incurved

beyond the middle, and mostly spreading to descending. Reports of L. porophilum Lloyd & Und. from Western Canada by Rydberg 1932, Macoun 1890, and others are likely to be based on various forms of L. Selago. However, we have not yet met with any specimen so named from Alberta. See Boivin 1966. Reports by Macoun 1890 of L. lucidulum Mx. from Laggan and B.C. have not been traced yet but are held as highly dubious and likely to be based on variants of L. Selago.

2. L. inundatum L. var. inundatum -- No rhizome, but producing a new bulb at the end of the season. Dichotomously divided into a creeping sterile shoot and an erect fertile one. Spike terminal, barely distinct. Sporophylls slightly longer than the leaves. Wet spots subject to spring flooding, especially in bogs. Lake Windrum. -- Aka, L-SPM, NS-O, nS, BC, US, Eur.

3. L. annotinum L. (var. acrifolium Fern.) -- Long superficial leafy rhizome present. Erect shoot dichotomously divided into a few erect branches. Leaves spreading to descending, usually serrulate. Spike solitary and sessile. Dense coniferous woods . -- K-Aka, L-SPM, NS-BC, US, Eur -- F. pungens (Desv.) M.P. Pors. (var. alpestre Hartm.) -- Erect shoots in denser tufts. Leaves strongly ascending to appressed, those of the fertile branches shorter, less than 5 mm long. Open, alpine or subarctic habitats. -- G-Aka, L-SPM, NS-BC, US, Eur.

Var. acrifolium is sporadic in its distribution and appears to be a morphological extreme with entire leaves. F. pungens appears to be an ecological variation and is geographically restricted to the same extent that its habitat is also restricted.

4. L. clavatum L. var. clavatum (var. megastachyon Fern. & Bissell) -- Clubmoss, Staghorn-Moss (Courants verts) -- Superficial leafy rhizome present. Leaf ending in a long conspicuous seta, these gathered in white to rusty tufts at the end of shoots. Spike long-peduncled, the peduncle bracteolate and often branched. Dry woods, usually coniferous woods. -- Aka, L-SPM, NS-BC, US, Eur. -- F. monostachyon (Desv.) Clute -- Shorter spike on a short peduncle, the latter usually shorter than the spike. Leaves shorter and more strongly incurved. More open and subalpine to subarctic habitats . -- G, K-Aka, L-NF, Q-(O)-Man-BC, (US), Eur.

The setae are commonly deciduous around the 5th or 6th year. On the Pacific slope the typical variety is partly replaced by a var. integerrimum with setae deciduous the very first year. The latter has also been reported from Wisconsin, but we have not yet been able to confirm this report. F. monostachyon appears to be an ecological variant essentially comparable to the f. pungens of the previous species. Other variations based on the size and number of spikes per peduncle do not seem to be in any way significant.

5. L. obscurum L. (f. exsertum Vict., var. dendroideum (Mx.) D.C. Eaton) -- Ground-Spruce, Ground-Pine (Petits Pins) -- Rhizome deeply buried. Erect shoots very branchy and looking like little trees, with a solitary or a few terminal sessile spi-

kes. Semi-open coniferous woods. -- (K)-Mack-Aka, L-SPM, NS-BC, US, (Eur).

A barely distinct form of sunny places is often called var. dendroideum, but a better name would seem to be f. exsertum as it hardly rates as a variety.

6. L. sabinifolium W. var. sitchense (Rupr.) Fern. (L. sitchense Rupr.) -- Ground-Fir -- Rhizome nearly superficial. Leaves partly adnate, this species being thus intermediate between the previous numbers with free leaves and the following ones strongly adnate. Sterile branches strongly ascending and flattened, but with those of the ventral and dorsal rows quite alike. Spike usually solitary, sessile. Acid soils from lake Hasbala westward. -- Aka, nS-BC, US, (Eur).

Our variety has dimorphic erect branches, the fertile ones being 2-3 times longer (exclusive of the sessile spike) than the sterile ones. The more eastern typical variety has subequal branches, but the spike is usually pedunculate. This morphological distinction is at variance with the usual treatment in current manuals and all specimens and reports of var. sabinifolium from Howard and elsewhere in our area have been revised accordingly. See Boivin 1966.

7. L. alpinum L. -- Similar to the following. Leaves of the ventral row strongly differentiated, shaped like a small trowel. Spike solitary and sessile. Light woods near timberline; Rockies -- G, K-Aka, L, Q, wAlta-BC, (US), Eur.

8. L. complanatum L. var. complanatum -- Ground-Cedar -- Rhizome deeply buried. Branches strongly flattened, much paler below, elongating each year, the annual growth being termed an innovation. The innovations separated by constrictions. The lower branches with (2)-3-4-(5) innovations. Leaves strongly adnate, those of the lower rank much smaller. Spikes long peduncled, mostly solitary. Dry woods, usually coniferous, and dry semi-open places. -- G, K-Aka, L-SPM, NS-BC, US, Eur. -- Var. Habereri (House) Boivin (var. Gartonis Boivin; L. tristachyum AA.) -- Usually longer and with more open branching. Most branches innovating but only once. Spikes usually geminate. Rhizome near the surface. Coniferous woods on light soils. -- sMack, sQ-nS, neUS, (Eur).

In some herbaria many specimens of L. complanatum have recently been revised to various hybrid combinations. We find these hybrids to be unconvincing on morphological ground and also because too many of them were collected way outside the range of one of the putative parents. Nearly all these so-called hybrids appear to fall within the normal range of variation of L. complanatum or its var. Habereri.

Order 2. SELAGINELLALES

Single family

2. SELAGINELLACEAE (SPIKEMOSS FAMILY)

Like small Club-Mosses, but with the spores sexually differentiated, the megaspore larger and 4 together in a sporangium.

1. SELAGINELLA Beauvois SPIKEMOSS

Small herbs, weakly rooted. Branching dichtomous. Spikes terminal and sessile.

a. Leaves merely acute, not bristle-tipped ..... 1. S. selaginoides

aa. Leaves bristle-tipped.

b. Glaucous, loosely tufted ..... 4. S. Wallacei

bb. Green, densely creeping.

c. Setae about 0.5 mm long ..... 2. S. rupestris

cc. Setae 1.0 mm long or more ..... 3. S. densa

1. S. selaginoides (L.) Link -- Very filmy and easily confused with a Hepatic, which it resembles. Two-toned. The sterile shoots dark green and creeping; the fertile one erect and straw-green. Leaves remotely dentate. Sporophylls loosely spreading. Creeping among the mosses in slightly disturbed places in bogs. -- G, K-Aka, L-SPM, NS, NB-BC, US, Eur.

2. S. rupestris (L.) Spring -- Small perennial resembling a small Lycopodium. Sterile branches about 1 cm high; the fertile ones (2)-3-(4) cm high. Leaves small and closely imbricated, ending in a seta 1 mm long or less. Forms a loose carpet on rocks or in dry Pine woods. -- G, NS, NB-neAlta, US, Eur.

Reports from southwestern Manitoba proved to be based on S. densa.

3. S. densa Rydb. var. densa -- A prairie species quite similar to the preceeding and often confused with it. Sterile branches about 4 mm high, the fertile ones 1.5-2.5 cm high. Terminal setae 1 mm long or more, forming conspicious tufts at the end of branches. Sporophylls ciliate to the tip. Forming compact flabelliform carpets on dry ground. Very common prairie species, but usually hidden and inconspicuous. -- swManseBC, US -- Var. scopulorum (Maxon) Tryon (var. Standleyi (Maxon) Tryon; S. scopulorum (Maxon) -- Sporophylls eciliate above the middle. Dry alpine habitats. -- (se Aka), swAlta-BC, US, (CA).

4. S. Wallacei Hier. -- Foliage somewhat glaucous. Similar to the previous two and often confused with them. Much larger and more loosely tufted and branched, the main shoots up to 10 cm long. Leaves and sporophylls minutely ciliate towards the apex, but eciliate or nearly so towards the base. Setae short, inconspicuous, less than 0.5 mm long. Dry, rocky mountain slopes: Waterton. -- swAlta-BC, US.

Class 2. ISOPSIDA
A single order, family and genus.

Order 3. ISOETALES -- 3. ISOËTACEAE (QUILLWORT FAMILY)

1. ISOËTES L. QUILLWORT

Tufted aquatic from a bilobed corm. All leaves bear a ventral sporangium with a small ligule above the sporangium. Spores of two kinds, the female ones much larger and termed "megaspores".

a. Megaspores covered with spinulose projections about as high as the equatorial and commissural ridges... ..... 1. I. echinospora
aa. Smaller and merely covered with tubercules which are about as high as wide and much lower than the ridges ..... 2. I. Bolanderi

1. I. echinospora Durieu var. Braunii (Durieu) Eng. (S. muricata AA.) -- Leaves soft, filiform, arched, entire, up to 15 cm long, bulbous at base. The bulbous part is hollowed out and contains a sporangium. Megaspores spinulose, about 1/2 a millimeter across. A bottom dweller is shallow waters of lakes. -- G, K-Aka, L-SPM, NS-BC, US.

Northeastward it gives way to var. Savilei Boivin, a smaller plant with smaller megaspores, about 1/3 mm across, varying from 300 to 400 μ. Our american varieties form the ssp. muricata (Durieu) Löve & Löve, characterized by the presence of stomata. These will be made conspicuous by the action of iodine as the guard cells accumulate starch. Stomata are absent in ssp. echinospora.

2. I. Bolanderi Eng. var. Bolanderi -- Leaves often longer, up to 25 cm long. Megaspores merely tuberculate and smaller, about 1/3 mm across. Alpine lakes in Waterton. -- swAlta-(BC), US.

In the southwestern USA occurs a var. pygmea Clute much smaller, 2.5 cm high or less, and with megaspores almost smooth.

Division 2. EQUISOPHYTA
A single class, order, family and genus.

Class 3. EQUISOPSIDA -- Order 4. EQUISETALES
4. EQUISETACEAE (HORSETAIL FAMILY)

1. EQUISETUM L. HORSETAIL

Herbs, easily coming apart at the nodes. Leaves verticillate, small and fused together into a sheath at each node. Branches verticillate and alternating with the leaves. Sporophylls peltate and verticillate in a terminal spike. Sporangia dorsal.

a. Stems all green and simple.
Isoëtes 14

b. Stems wall paper-thin and easily crushed.. ..... 9. E. fluviatile
bb. Stem stiff with thick wall and smaller central cavity.
c. Small plants; sheath with 3 teeth only ..... 4. E. scirpoides
cc. Larger; teeth much more numerous.
d. Teeth persistant; stem up to 2.5 mm thick ..... 3. E. variegatum
dd. Teeth deciduous; stem usually much larger.
e. Stems annual; sheath with a ring of brown dots ..... 1. E. laevigatum
ee. Stems biennial; sheath soon developping two black rings... 2. E. hyemale
aa. Stems branched, at least the sterile ones; fertile stems sometimes yellow and simple.
f. Branches ramified; sheath two-toned, green at base, brown at top..... 7. E. sylvaticum
ff. Branches normally simple; sheath green only.
g. Lowermost internode on each branch longer than the corresponding sheath on the stem ..... 5. E. arvense
gg. Lowermost internode on each branch as long as or shorter than the corresponding sheath on the stem.
h. Sheath of the branches 3-toothed..6. E. pratense
hh. With (4)-5-(6) teeth.
i. Stem-sheaths with 6-8 teeth...8. E. palustre
ii. With 10-30 teeth .....9. E. fluviatile

1. E. laevigatum Braun (E. hyemale L. var. intermedium A.A. Eaton; E. kansanum Schaffner; E. intermedium (A.A. Eaton) Rydb.) -- (Prêle) -- About 1 mm high, often producing tufts of short stems. Stem simple, pale green, not overwintering. Sheath slightly constricted at base, about 2-3 times longer than wide at base and slightly flaring. Sporesis mostly in mid-summer. Open places, often hilly and sandy. -- Q-BC, US, (CA).

Quite easily recognized by its pale green colour and the ring on the sheath reduced to a row of brown dots. New shoots will produce a spike the very first year and sporesis takes place around the middle of summer. The stems do not persist but are regularly winter-killed. The base of an old stem will often generate a tuft of very thin stems which are usually sterile and may vary from straight to flexuous, thus resembling E. variegatum in habit. Yet these thin stems should be readily recognized by the unique type of sheath of E. laevigatum. The base of an old stem will sometimes persist into a second summer; it will then develop sets of rings that may somewhat resemble those of E. hyemale. Most of our personal collections of E. laevigatum will illustrate its usual dimorphism in stem size and shape.

In our field experience this species and the next two are

quite sharply distinct and never hybridize. However, in the herbarium, the distinction is not always so obvious and a fair proportion of specimens will seem to be more or less intermediate. These atypical specimens are variously treated as varieties or species or as interspecific hybrids. Mostly they will be found filed under one or the other of the following names or formulae.

E. hyemale X laevigatum = E. hyemale var. intermedium A.A. Eaton = E. Ferrissii Clute. We have examined quite a few specimens identified by Hauke to E. Ferrissii and we are not satisfied that they show morphological evidence for their hybrid status; nearly all specimens seemed to fall well within the normal range of variation of E. laevigatum and have been so revised. According to the map published, the range of E. Ferrissii extends a long way beyond the range of one of the putative parents, certainly not a feature to be normally expected in a hybrid.

E. laevigatum X variegatum = E. variegatum var. Nelsonii A.A. Eaton = E. Nelsonii (A.A. Eaton) Schaffner. Under those names one finds mostly small specimens of E. laevigatum. E. Nelsonii is treated as a hybrid by Hauke 1963 and, as in the case of E. Ferrissii, his distribution map shows E. Nelsonii extending well beyond the range of one of its putative parents. The morphological evidence of hybridity is not convincing.

E. hyemale X variegatum = E. hyemale var. Jesupii (A.A. Eaton) Vict. = E. trachyodon AA. Specimens filed under those names are usually small individuals of E. hyemale. These seem to be sporadic in the range of the species, being perhaps more frequent northward. As in the two cases previous, the morphological evidence for hybridity is not convincing.

2. E. hyemale L. var. affine (Eng.) A.A. Eaton (var. elatum (Eng.) A.A. Eaton, var. pseudohyemale (Farw.) Morton, var. robustum (A.Br.) A.A. Eaton, E. affine Eng.; E. prealtum Raf.) -- Scouring Rush (Prêle des tourneurs) -- Stem dark green, commonly 1 m high, simple, overwintering. Sheath cylindric, short, up to 1 1/2 times as long as large, soon developing two black rings separated by a gray zone. Sporesis sometimes in the fall of the first year, most often in the spring of the second year. Humid and sandy places, most often on embankments. -- Mack-Aka, (NF), NS, NB-BC, US, (Eur).

The internodes are ridged longitudinally and in our american var. affine the ridges are crested by a single row of minute and inconspicuous siliceous tubercules. In the eurasian var. hyemale the tubercules form a double row on the crest of each ridge. This difference is not always very clear, but is a valid one if the two varieties are treated as populations.

The stems of this species are very dark green and, like E. laevigatum, they are dimorphic although not in the same manner. First year stems are lighter in colour and usually sterile, but they may produce toward the middle of the summer a spike which will achieve sporesis in the fall. The second year the stems will have appreciably darkened and most of them will produce a spike which will mature before the end of spring. Generally the

stem will be frost-killed during the second winter, but an occasion it may survive for a third season and will then produce short fertile branches (=f. polystachyum Prager). This branching and production of more than one spike may also appear during the second summer on stems that may have suffered during the first winter some frost damage affecting only the summit of the stem. Our collection no. 13 611 from Pend-d'Oreille Lake in Idaho was meant to illustrate the stem dimorphism of this species.

Such individuals as may be more luxuriant, being taller and coarser, are often named var. californicum Milde or var. elatum or var. robustum. These forms are occasional in the range of the species and hardly deserve taxonomic rank, even if they seem to be somewhat more frequent southward.

3. E. variegatum Schleicher -- Similar to the preceeding, but generally smaller. Stems simple, annual, up to 4 dm high, up to 2.5 mm thick. Sheath with a single brown or black ring and persistent teeth. Shores and wet coniferous woods. -- G-Aka, L-NF, (SPM), NS, NB-BC, US, Eur.

As with the first two species, extreme forms have received names. Var. alaskanum A.A. Eaton will designate the more vigorous plants while var. anceps Milde, or better f. anceps (Milde) Braun, will refer to those with more delicate stems.

4. E. scirpoides Mx. -- Smallest and forming a dark, dense, tangled carpet on the forest floor. Stems only 5-12 cm long, dark green, simple, flexuous and without a central cavity. Sheath with only 3 teeth. Mostly coniferous woods. -- G-Aka, L-SPM, NS-BC, US, Eur.

5. E. arvense L. (var. boreale (Bong.) Led.) -- Horsetail (Queue de renard) -- Stems of two kinds, the fertile ones simple, very early, yellow and soon disappearing. The sterile ones appearing a little later, with simple solid branches. Sheaths of the branches with 3-4 lanceolate teeth 1 mm long or more. Everywhere, especially in wet places. -- G, K-Aka, L-NF-(SPM), NS-BC, US, Eur. Afr.

A most plastic species with scores of named forms and varieties. The most popular one is var. boreale in which the branches are essentially trigonous while they are tetragonous in var. arvense. The first is mostly found in shaded places and the second occurs mainly in more sunny habitats. Apparently these varieties are only minor ecological forms.

6. E. pratense Ehrh. -- Meadow-Horsetail -- Stems of two kinds, the fertile ones very rare, appearing in early summer, pale green, branched or soon branching. Sterile stems with simple branches spreading. Sheaths of the branches with 3 deltoid teeth less than 1 mm long. Dense woods near water. -- Mack-Aka, NF, NS, NB-BC, US, Eur.

7. E. sylvaticum L. var. multiramosum (Fern.) Wherry (var. pauciramosum AA.) -- Bottle-Brush -- Branches flexuous and ramified. Stem finely pubescent. Shoots of two kinds, appearing at the same time, the fertile ones with the longest branches uppermost, the sterile ones with the longest branches lowermost. Sheaths of the stem with large russet teeth fused in 3 or 4 groups.

Sporesis in late spring. Woods, especially coniferous woods. -- G, K-Aka, L-SPM, NS-BC, US.

Typically var. multiramosum has smooth branches while the eurasian var. sylvaticum is minutely glandular-scabrous along the ridges of the branches. As pointed out by Fassett 1944 and as we have been able to check in the field and in the herbarium, the distinction is a statistical one and is valid only if the two varieties are treated as populations on a continental scale. It is not difficult to find in the range of one variety, especially in the northern part of the range, a specimen that could pass as typical of the other variety.

In Ungava and eastward one may find another variety, var. pauciramosum Milde, with much reduced branching. Many authors do not distinguish this entity, in which case the correct name for var. multiramosum becomes var. pauciramosum because the latter antedates the former by nearly a century. Hence all reports of var. pauciramosum west and south of Ungava and Newfoundland should be interpreted as applying to var. multiramosum.

8. E. palustre L. var. simplicissimum Braun -- Bog-Nut -- Sterile and fertile shoots rather alike and normally branched, the branches rather coarse and nearly as thick as the stem. Lowest branches internode very short, with a central cavity and with sheath bearing (4)-5-(6) teeth. Shores of larger rivers. -- Mack-Aka, L-NF, NB-BC, US.

The eurasian var. palustre bears branches with their middle sheaths cut into teeth only (0.5)-0.8-1.2-(1.5) mm long. Our american phase is weakly differenciated by a number of statistical differences of which the strongest is found in the length of the teeth of the middle sheaths of the branches; these are (1.0)-1.5-2.5-(3.0) mm long in american plants. The latter was first distinguished as var. americanum Vict. 1927 but there are three earlier names available of which var. simpicissimum Braun is the earliest and correct name as pointed out by Boivin 1951.

9. E. fluviatile L. (E. limosum L.) -- Pipes (Pipes) -- Stem with the largest central cavity and the thinnest walls, thus very easily flattened. Very variable, simple to much branched. Sterile stems long attenuate at tip, otherwise similar to the fertile ones. Stem sheaths short, with numerous small and strongly blackened teeth. Branches hollow. Wet spots and shallows. -- K-Aka, L-SPM, NS-BC, US, Eur.

Division 3. PTEROPHYTA

Reproducing by seeds or by spores borne in marginal or dorsal sporangia. Leaf (or frond) usually well developed and rather large.

Sub-division 1. PTEROPHYTINA

Herbs with rather large fronds which are usually much divided. Venation usually more or less dichotomous. Sporangia borne on the back of fronds or at the margin of specialized shoots. A single class.

Class 4. PTEROPSIDA

a. Frond dichotomously divided into a leafy branch and a fertile branch; sporangia not clustered in sori, but more or less scattered, rather large and individually noticeable and usually sessile. ..... Order 5. Ophioglossales

aa. Frond usually pinnately divided; sporangia small, submicroscopic, usually stipitate and aggregated in discrete sori ..... Order 6. Filicales p. 21

Order 5. OPHIOGLOSSALES

Sporangia marginal, scattered, often sessile or nearly so. Frond divided in such a way as to look like a stem with a terminal insporescence and a single cauline or basal leaf.

5. OPHIOGLOSSACEAE (ADDER'S TONGUE FAMILY)

A single genus with us.

1. BOTRYCHIUM Swartz

Fertile segment a terminal panicle. Sterile segment ± divided.

a. Sterile segment triangular, peduncled and inserted near the base of scape.
  b. Sterile segment ternately compound... 1. B. multifidum
  bb. Sterile segment simple to trifoliate ... 4. B. simplex

aa. Sterile segment sessile to short-peduncled, inserted toward the middle or upper part of the stipe.
  c. Sterile segment 1-4 dm wide ..... 7. B. virginianum
  cc. Sterile segment smaller.
    d. Sterile segment ± lanceolate.
      e. Pinnae broadly flabelliform..... 2. B. Lunaria
      ee. Pinnae ovate or obovate.
        f. Pinnae obovate, entire ..... 4. B. simplex
        ff. Pinnae ovate, pinnatifid ... 3. B. boreale
    dd. Sterile segment not so elongate, deltoid to triangular-lanceolate.
      g. Sterile blade ± deltoid..... 6. B. lanceolatum
      gg. Sterile blade ± triangular, about twice as long as broad ..... 5. B. matricariifolium

1. B. multifidum (Gmelin) Rupr. var. multifidum -- Sterile segment 1 dm wide or less ± bipinnatipartite, broadly deltoid, inserted near the base of the stipe. Last year's blade often overwintering, the plant thus appearinb bifoliate. Sporesis in late summer. Sandy sterile prairies. -- Mack, (L)-NF, NS-BC, US, Eur -- Var. intermedium (D.C. Eaton) Farw. (B. silaifolium Presl; B. ternatum Sw. var. intermedium D.C. Eaton) -- Larger and coarser. Blade up to 2.5 dm wide and ± tripinnatipartite. -- (Aka), L-NF, NS, (NB)-Q-BC, US.

2. B. Lunaria (L.) Sw. -- Moonwort (Herbe à la lune) -- The lanceolate limb simply pinnate, the pinnae broadly flabelliform. Insertion near the middle of the stipe. Open to semi-open places on sandy soils or dry bogs. -- G, K-Aka, L-SPM, NS, Q-BC, US, (SA), Eur, (Oc).

More luxuriant specimens with slightly larger spores have been segregated variously as a form, variety or species (B. manganense Vict.). This uncommon extreme appears to be sporadic in its distribution and its taxonomic significance is not obvious. The last monographer of the group, Clausen 1938, reports it from all three of our provinces, but the Saskatchewan report actually originated from Boss Hill Creek in southwestern Manitoba.

3. B. boreale Midle var. obtusilobum (Rupr.) Brown -- Much like the preceeding, the limb somewhat larger, the pinnae ovate and pinnatifid. Grassy mountain slopes, below or above treeline. Often looking like a very lush B. Lunaria. -- Y-Aka, swAlta-BC, (US).

The eurasian var. boreale (including var. crassinervium (Rupr.) Christ.) has the sterile limb shorter and less deeply cut, the pinnae more clearly obovate or even flabelliform.

4. B. simplex E. Hitch. var. simplex -- Smallest and least divided. Up to 12 cm high. Limb 1-2 cm long, simple or trilobed to trifoliate, petiolate, inserted near the base. Sterile, open places: North Battleford -- NF, NS, NB-O, S, BC, US, Eur -- Var. tenebrosum (A.A. Eaton) Clausen -- Limb more elongate and more divided into 3-7 obovate pinnae. Peduncle 1-3 cm long, inserted towards the middle. Often looking like an intermediate to B. Lunaria, but the pinnae not flabelliform. -- Aka, NB-O, S-Alta, US, Eur.

A Macoun collection from Silver City (MTMG; DAO, photo) was originally cited by Burgess 1887 under B. matricariifolium. It was later revised to B. simplex by G.E. Davenport and cited accordingly by Macoun 1890. Upon examination, this collection proved to be made of immature specimens of B. Lunaria. This was the basis for all subsequent reports of B. simplex and B. matricariifolium for Alberta, but our own reports are based on more recent collections from Rich Valley (ALTA; DAO, photo) for B. simplex var. tenebrosum and Wilderness Park (DAO) for B. matricariifolium. The var. tenebrosum collection is not very uniform.

5. B. matricariifolium Braun (var. hesperium (Maxon & Clausen) Boivin; B. ramosum AA.) -- Middling in size and form. Sterile segment inserted above the middle, generally short peduncular, ± bipinnatipartite and ± triangular (that is about twice as long as large), the ultimate segments commonly obovate. Moist prairies and shores. -- (NF)-SPM, NS-BC, US, Eur.

6. B. lanceolatum (Gmelin) Rupr. (var. angustisegmentum Pease & Moore) -- Much like the preceeding, but the sterile segment larger, sessile and inserted near the base of the panicle. Limb deltoid (that is nearly as wide as long), its ultimate segments tending to lanceolate. Moist prairies. -- G, (Y-Aka), L-(NF)-SPM, NS-Q-(O), swS-swAlta-BC, US, Eur.

Usually grows with B. matricariifolium and often giving the

impression (perhaps fully justified) of being only a later maturing growth phase of B. matricariifolium. There is 2-3 weeks difference in the sporesis time of the two entities.

7. B. virginianum (L.) Sw. (var. europaeum Ångström) -- Rattlesnake-Fern. -- Largest and most divided, 2-5 dm high, the stipe puberulent near the base. Sterile segment (1)-2-3-(4) dm wide, sessile or nearly so, inserted near the middle, tripinnatitipartite to quadripinnatifid. Rich woods. -- K-Mack, Aka, L-NF, NS-BC, US, (SA), Eur -- F. anomalum Cody -- Lower segment partly modified and bearing some sporangia along with the normal green tissue. McKague. -- Q-O, S.

Plants of more sunny places have a smaller, less divided and more leathery limb, along with slightly larger sporangia. These are often segregated as var. europaeum, undoubtedly a mere ecological form.

Order 6. FILICALES

Sporangia submicroscopic, generaly stipitate and borne dorsally on normal or specialized fronds.

a. Sporangia disposed in a continuous manner along the limbless divisions of the rachis, not aggregated into sori ..... 6. Osmundaceae p. 21
aa. Sporangia disposed in clusters termed sori.
b. Frond looking like a 4-leaved clover ..... 11. Marsileaceae p. 31
bb. Frond looking more like a typical Fern.
c. Frond simple, pinnatipartite.. ..... 10. Polypodiaceae p. 30
cc. Frond compound, at least at base.
d. Sori marginal and protected by the more or less revolute margin; pinnulae most often discrete and petiolulate ..... 7. Pteridaceae p. 22
dd. Sori more or less removed from the flat or revolute margin; limb never divided into entire, discrete and petiolulate leaflets.
e. Indusium lacking or attached by a point only ..... 8. Aspidiaceae p. 24
ee. Indusium placed laterally and attached by its whole length.
f. Fronds evergreen, 1.5 dm long or less... 9. Aspleniaceae p. 30
ff. Fronds not evergreen, much larger ..... 8. Athyrium p. 29

6. OSMUNDACEAE (FLOWERING FERN FAMILY)

Sporangia not aggregated in sori, but disposed continuously along some branches of the rachis.

1. OSMUNDA L. FLOWERING FERN

The fertile pinnae devoid of leafy tissue.

1. O. Claytoniana L. var. Claytoniana -- Interrupted Fern -- A rather large frond, pinnate, the pinnae pinnatifid. Some fronds are sterile, others are interrupted towards the middle by 2 to 4 pairs of fertile pinnae. Wet and marshy places. -- L-SPM, NS-seMan, US.

Younger fronds of var. Claytoniana exhibit a barely tinted pubescence, merely light brown, while the hymalayan var. vestita (Wall.) Milde has russet pubescence.

7. PTERIDACEAE (BRACKEN FAMILY)

The fertile fronds commonly made of distinct leaflets, more or less entire and petiolulate. Sori marginal, protected by the revolute margin of the limb, or by an indusium, or both. Indusium, if present, often more or less continuous along the margin.

a. Leaflets strongly asymetrical and bearing sori along one edge only ..... 5. Adiantum

aa. Bearing sori along both sides.

b. Frond 3-10 dm high ..... 1. Pteridium

bb. Frond smaller, 2.5 dm high or less.

c. Stipe dark, brown to black.

d. Segments deeply dissected ..... 2. Cheilanthes

dd. Segments entire ..... 3. Pellaea

cc. Stipe pale, green to pale green ... 4. Cryptogramma

1. PTERIDIUM Gleditsch BRACKEN

Scales lacking. Fronds all alike, with deeply divided segments and a continuous marginal sorus.

1. P. aqualinum (L.) Kuhn var. latiusculum (Desv.) Underw. (Pteris aquilina AA.) -- Bracken, Brake -- Large coarse fern with a more or less deltoid limb, not tufted, but with a deeply buried elongate rhizome. Limb tripinnatifid to tripinnate, glabrous or pubescent along the margin and the midnerve below. Light and sandy soils. -- NF-SPM, NS-(PEI-NB)-Q-(O)-sMan, swAlta, US, (CA, Eur) -- Var. champlainense Boivin (var. pubescens AA.) -- Similar but not deltoid and more pubescent. Limb rather ovate and puberulent over the whole of the under surface.—Q-seMan, US--Var. pubescens Underw. -- Larger and more pubescent. Frond commonly 1 mm high or more, its growth protracted, the growing tip remaining active a good part of the summer. Limb ovate, pubescent on both surfaces more so below. Waterton. -- (Aka), swAlta-BC, US, (CA).

Our varieties belong to the largely boreal ssp. aquilinum in which the ultimate segments are not wing-decurrent on the lower side or are equally wing-decurrent on both sides. In the mainly austral ssp. caudatum (L.) Bonaparte, the ultimate segments are decurrent on the lower side only, or at least more strongly so on the lower than on the upper side.

2. CHEILANTHES Swartz LIP-FERN

Margins revolute mostly towards the tips of the lobes of pinnules. Fronds not dimorphous.

1. C. Feei Moore -- A small tufted fern, extremely pubescent. Stipe woolly, brown. Limb ± tripinnate, gray-tomentose above, densely woolly below. Limestone cliffs: Rockies. -- swAlta-BC, US.

3. PELLAEA Link CLIFF-BRAKE

Stipe dark colored. Fronds slightly dimorphic, the fertile ones with the margin of the limb continuously revolute all around the pinnule.

1. P. glabella Mett. var. simplex Butters (P. atropurpurea (L.) Link var. simplex (Butters) Morton; P. Suksdorfiana Butters) -- Rock-Brake -- Stipe brownish, black and shiny. Limb pinnately divided into discrete, petiolulate, entire leaflets. Rhizome and base of stipe densely scaly. Scales made of linear cells, these 10-15 times as long as wide. Cracks of calcareous rocks. -- swAlta-BC, (wUS) -- Var. nana (Rich) Cody (P. glabella Mett. var. occidentalis (E. Nelson) Butters) -- Usually smaller but the main characters detectable only with a strong hand-lens or binnocular with power about X20: scales with cells oblong-lanceolate and only 3-5 times as long as wide. Lower pinnae often trilobed or trifoliate. -- swMack, Man-Alta, US.

Reports of P. atropurpurea from northern Saskatchewan are based on specimens (BM, CAN, DAO) which appear to be quite typical of var. nana as to pubescence of stipe and rachis, size and division of the frond, shape of cells of scales, etc.

4. CRYPTOGRAMMA Br. ROCK-BRAKE

Stipe pale. Fronds strongly dimorphous, the fertile ones similar to Pellaea minus the dark stipe and rachis.

a. Fronds tufted and coriaceous ..... 1. C. crispa
aa. Fronds spaced along the rhizome and very thin. 2. C. Stelleri

1. C. crispa (L.) Br. var. acrostichoides (Br.) C.B. Clarke -- Mountain-Parsley, Parsley-Fern -- Densely tufted and green, the fertile fronds twice larger and divided into entire, linear, petiolulate leaflets. Limb thickish, that of the fertile fronds strongly revolute. Crevices of dry precambrian and other acidic rocks. -- Mack-Aka, (L, Q)-O-BC, US, (Eur).

The eurasian var. crispa has thinner fronds in a lighter green and the basal scales are mostly of a uniform brown colour; the latter are mostly with a paler central zone in our american variety. Reports of this species for Baffin Island are rated as improbable; those for Labrador and Quebec have yet to be verified or confirmed.

2. C. Stelleri (S.G. Gmelin) Prantl -- Similar but not tufted, the fronds arising singly from an elongate rhizome. Limb

of the sterile frond very filmy. Shaded limestone cliffs. -- Y-Aka, (L)-NF, NS, NB-O, swAlta-BC, US, Eur.

The Porter Lake, Sask., reports are not substantiated by any specimen that we know of in Saskatchewan herbaria or elsewhere.

5. ADIANTUM L.

No indusium, but the edge of the leaflets is folded over in a very good imitation of an indusium, the sorus borne under the folded over portion. Revolute margin discontinuous, cut up into 3-6 segments per leaflet.

1. A. pedatum L. var. aleuticum Rupr. -- The frond cut in a most unusual manner. Petiole and rachises jet-black and shiny. Petiole bifurcate at summit; each primary branch is recurved and bears, on one side, 3-6 secondary branches, each of which is pinnately divided into numerous, petiolulate, asymetrical leaflets. Damp woods and rocky subalpine slopes, rare. -- Aka, NF, Q, swAlta-BC, US, (Eur).

In the typical eastern phase the limb is spread out horizontally. In our variety the frond is somewhat reduced and its primary segments are divergent to nearly erect. This distinction cannot always be applied satisfactorily and at times appears to be merely ecological.

8. ASPIDIACEAE (SHIELD-FERN FAMILY)

Family rather polymorphic, of miscellaneous Fern types. Sori commonly round or roundish. Indusia absent or more often present; if present, nearly always attached by a single point. Athyrium is an atypical genus with the sori elongate and the indusia attached lengthwise.

a. Fronds strongly dimorphous, the fertile ones with the limb reduced to a mere envelope for the sori ..... 1. Onoclea
aa. Fronds all alike or near similar with a normal limb well developed.
b. Not tufted, but the rhizome long stoloniferous, sori mostly devoid of indusia.
c. Lowest pinnae with a well developed petiole.
d. Indusium absent; limb essentially bipinnate ..... 5. Carpogymnia
dd. Indusia present; limb tripinnate to quadripinnatipartite ..... 7. Cystopteris
cc. All pinnae sessile or practically so ..... 6. Thelypteris
bb. Tufted.
e. Sori without indusia ..... 8. Athyrium
ee. Indusia present.
f. Sori elongate; indusia attached lengthwise ..... 8. Athyrium

ff. Sori roundish; indusia attached by a point.
g. Indusium placed under the sorus.. 2. Woodsia
gg. Indusium covering the sorus.
h. Indusium hoodlike and attached laterally ..... 7. Cystopteris
hh. Indusium flattish and attached in the center of the sorus.
i. Indusium peltate .... 3. Polystichum
ii. Indusium reniform-cordate, attached at the sinus ..... 4. Dryopteris

1. ONOCLEA L.

Fronds strongly dimorphic, the fertile one much contracted, much less divided, strongly enveloping the sori, and brownish or blackish rather than green.

a. Frond oblanceolate .....1. O. Struthiopteris
aa. Deltoid and smaller .....2. O. sensibilis

1. O. Struthiopteris (L.) Hoffm. var. pensylvanica (W.) Boivin (Matteuccia Struthiopteris (L.) Tod. var. pensylvanica (W.) Morton; Pteretis nodulosa (Mx.) Nieuwl.) -- Fiddle-Heads-- Our largest fern, commonly 1 mm or more high. Frond pinnate, the pinnae pinnatifid. The fertile frond dark, much simpler and only half as long. Damp woods. -- Mack, Aka, (NF), NS-BC, US.

Scales from the base of the stipe are uniformly brown in our variety, but show a blackish-brown central band in the typical eurasian phase.

Often placed in a segregate genus justified primarily by the simple type of nervation of this first species as constrasted with the anastomosed nerves of the next. As shown by Boivin 1961, the type of nervation is merely a reflection of the degree of expansion of the ultimate segments.

2. O. sensibilis L. -- Limb rather triangular and nearly simple, pinnate at base, pinnatipartite above, the segments not cut but merely undulate at margin. Wet and marshy places, often on shores . -- L-SPM, NS-seMan, US, Eur.

2. WOODSIA Br.

Indusium neither covering nor protecting the sorus, but reduced to few laciniae more or less hidden under the sorus or seemingly mixed with the sporangia.

a. Stipe articulate, with a well defined abscission point.
b. Frond glabrous.
c. Stipe chaffy ..... 2. W. alpina
cc. Not chaffy above the articulation ... 3. W. glabella
bb. Frond densely chaffy and pubescent below. 1. W. ilvensis

aa. Stipe not articulate, the old fronds breaking off rather irregularly ..... 4. W. oregana

1. W. ilvensis Br. -- Our chaffiest and most pubescent species. All parts of the frond abundantly covered with chaff and long hairs, especially so on the under surface of the limb. Hairs and chaff at first white, soon becoming rusty and quite conspicuous. Stipes articulate and breaking off in age at the articulation point, leaving behind a tuft of stubs of nearly equal length. Very common on dry non calcareous cliffs. -- G-Aka, L-NF, NS, NB-BC, Us, Eur.

2. W. alpina (Bolton) S.F. Gray -- Similar to the following, the stipe darker, bright brown, and chaffy below the limb. Pinnae slightly larger and slightly more divided. Shaded cliffs: Lake Todd. -- (G)-F-(K-Mack)-Y-Aka, (L)-NF, NS, (NB)-Q-Man, (BC, US), Eur.

3. W. glabella Br. -- Limb narrow and up to 2 dm long, being composed of numerous small deltoid pinnae that are nearly all of the same size. Limb glabrous and not chaffy. Stipe pale green, glabrous, not chaffy except below the articulation. Shaded, moist, calcareous or dolomitic cliffs. -- G-Aka, L-NF, NS, NB-BC, US, Eur.

4. W. oregana D.C. Eaton var. oregana -- Fronds 1-2 cm long, densely tufted. Stipes not articulate, the old ones breaking off rather irregularly, leaving behind a cluster of very uneven stubs, some of them often half as long as the remaining fronds. Limb lanceolate, pinnate and neither pubescent nor glandular, nor chaffy. Or sometimes the stipe and the limb slightly glandular, especially towards the insertion point of the pinnae. All sorts of rocky cliffs. -- Q-O, nwS-BC, US -- F. Cathcartiana (Rob.) Boivin -- Neither pubescent nor chaffy, but abundantly and finely glandular throughout: Boisé Coteau. -- Q-O, swS, BC, US -- Var. Lyalli (Hooker) Boivin (W. scopulina D.C. Eaton) -- Not chaffy, but abundantly pubescent and glandular throughout. -- Y-(Aka), Q-O, nwS-swAlta, gBC, US -- Var. squammosa Boivin -- Stipe chaffy and also lightly pubescent and glandular. Limb usually neither pubescent nor glandular, but sparsely chaffy, especially dorsally. Amisk Lake. -- wO, ecS, US.

3. POLYSTICHUM Roth

Evergreen fronds with round and peltate indusia.

1. P. Lonchitis (L.) Roth -- Horehound, Holly-Fern (Tripe de roche) -- Frond pinnate, narrowly oblanceolate. Pinnae lanceolate, serrate, with a single lobe near the base on the distal side. Shaded mountain cliffs and rocky slopes. -- G, (Y)-Aka, (L)-NF, NS, (NB)-Q-O, swAlta-BC, US, Eur.

4. DRYOPTERIS Ad. SHIELD FERN

Indusium reniform and attached from the bottom of the sinus.

a. Fronds marcescent, 3 dm long or less ..... 4. D. fragrans

aa. Fronds longer.
b. Limb bipinnate ..... 1. D. austriaca
bb. The limb less divided, pinnate or bipinnatifid to bipinnatipartite.
c. Fronds dimorphous, pinnae up to 6 cm long ..... 3. D. cristata
cc. Fronds all alike, larger, the main pinnae much longer ..... 2. D. Filix-Mas

1. D. austriaca (Jacq.) Woynar (var. dilatata (Hoffm.) Schinz & Thell., var. spinulosa (Müller) Fiori; D. dilatata (Hoffm.) Gray; D. spinulosa (Müller) Watt, var. americana (Fischer) Fern.; Aspidium spinulosum (Muller) Sw., var. dilatatum (Hoffm.) Link, var. intermedium (Muhl.) D.C. Eaton) -- Wood-Fern, Florist's Fern -- A large common wood fern with very much dissected fronds, used by florists as background foliage for bouquets. Up to 1 m high, the limb bipinnate and the pinnulae pinnatifid to pinnatipartite. Fronds not dimorphous, but overwintering under the snow. Showy in moist woods. - G, K-(Mack-Y)-Aka, L-NF-(SPM), NS-BC, US, Eur, (Afr).

Usually divided in a series of segregates variously treated as varieties or species. We derive no intellectual satisfaction from their recognition, there is too much arbitrariness in the identification of many specimens and the various phenotypes appear to be more or less sporadic in their occurence, with most names used having european type localities.

2. D. Filix-Mas (L.) Schott -- Very scaly throughout and the scales mostly filiform, often present even in the sinuses of the marginal teeth. Similar to the following, but not dimorphous and larger; the main pinnae 7-15 cm long. Frond 4-10 dm long, the limb 12-30 cm wide and usually oblanceolate. Mid summer. Wet woods and cliffs near lakes and rivers: Waterton.--G, NF, NS, Q-O, Alta-BC, US, Eur.

3. D. cristata (L.) Gray var. cristata (Aspidium cristatum (L.) Sw.) -- Fronds slightly dimorphous, the fertile ones slightly longer and narrower with the pinnae broader and ascending. Frond 5-6 dm high, the limb oblong-lanceolate to ovate-lanceolate. Indusia rather small, not fully covering the mature sori. Wet or boggy woods. -- NF-(SPM), NS-BC, US, Eur.

Grades eastward into a var. Clintoniana (D.C. Eaton) Und., with somewhat larger and non dimorphic fronds.

4. D. fragrans (L.) Schott (var. remotiuscula Kom.; Aspidium fragrans (L.) Sw.) -- A conspicuous cliff species with a tuft of green fronds arising from a much larger tuft of pendant old dead darkened fronds. Limb discolor, dark green above, bluish to rusty below. Indusia largest, persistent and imbricated, covering the lower face of the limb almost entirely. Dry rocky and steep habitats. -- G-Aka, L-NF, NS, NB-BC, US, Eur.

Larger plants from more southern and usually shaded cliffs are frequently distinguished as var. remotiuscula; probably little more than an ecological form.

5. CARPOGYMNIA Löve & Löve

Not tufted. Limb more or less ternately divided. Indusium absent.

1. C. Dryopteris (L.) Löve & Löve, var. Dryopteris (Dryopteris disjuncta AA.; Gymnocarpium Dryopteris (L.) Newm.; Phegopteris Dryopteris (L.) Fée) -- Oak-Fern -- A delicate, much divided, deltoid frond occurring scattered on the forest floor. Forms large colonies. Stipe black below. Limb 0.5-2.0 dm large, bipinnate and often somewhat ternately disposed in three planes. Rachis and limb glabrous or nearly so. Largest pinnulae pinnatipartite. Rich forests, especially coniferous ones. -- G, K-Aka, L-NF, NS-BC, US, Eur -- Var. disjuncta (Led.) Boivin -- Frond larger, 2-3 dm wide. Largest pinnulae pinnatisect at the base. Waterton. -- Alta-BC, nwUS -- Var. pumila (DC.) Boivin (G. Robertianum Hoffm.; Dryopteris Robertiana (Hoffm.) Christensen; Phegopteris Robertiana Hoffm.) A. Br.) -- Abundantly and finely glandular, especially along the rachis. Limb 2.5 dm wide or less, often less clearly ternate, often more triangular than deltoid. Sheltered calcareous rocks. -- Mack-Aka, NF, NB-BC, US, Eur.

Var. disjuncta (Led.) stat. n., Polypodium Dryopteris L. var. disjunctum Led., Fl. Ross. 4: 509. 1853.

Var. pumila (DC.) stat. n., Polypodium Dryopteris L. var. pumilum DC., Fl. Fr., ed. 3, 2: 565. 1815. This is a weak variety or possibly only an ecological form of shaded calcareous cliffs; intermediate specimens have been variously treated now as a form, now as interspecific hybrids.

6. THELYPTERIS Schmidel

Technically much like Carpogymnia long stoloniferous and not tufted. Indusia absent or present. Limb pilose along the nerves, often ciliate.

a. Limb pinnate, lanceolate .....1. T. palustris
aa. Limb broadly triangular, nearly simple.... 2. T. Phegopteris

1. T. palustris Schott var. pubescens (Lawson) Fern. (Aspidium Thelypteris AA.; Dryopteris Thelypteris (L.) Gray var. pubescens (Lawson) Nakai) -- Marsh-Fern -- Slightly dimorphous, the fertile fronds appearing more open because of the revolute margin of the limb. Limb lanceolate, pinnate, the pinnae pinnatifid, more or less pilose, especially along the main nerves. Indusia present. Marshes. -- (NF)-SPM, NS-O(Man, US).

2. T. Phegopteris (L.) Slosson (Dryopteris Phegopteris (L.) Christensen; Phegopteris polypodioides Fée) -- Beech-Fern. -- Limb broadly triangular and nearly simple. At least the lower two segments discontinuous from the rest, thus the limb is pinnate at base, pinnatipartite above. Ciliate and pilose along the nerves. No indusium. Wet woods. Unaccountably rare: lake Todd, lake Axis and Assineau. -- G, Y-Aka, L-SPM, NS-BC, US, Eur.

With only one known collection per province, we admit to being puzzled by this high degree of sporadism.

7. CYSTOPTERIS Bernh., FERN-BLADDER

Indusium hood-shaped, attached laterally and enveloping the sorus from the side. The indusium is early deciduous and this genus in thus not always easy to recognize.

a. Limb ± lanceolate, longer than its stipe..... 1. C. fragilis
aa. Limb ± deltoid, much shorter than its stipe... 2. C. montana

1. C. fragilis (L.) Bernh. var. fragilis (Filix fragilis (L.) Gilib.) -- Our only common and widely distributed species in the prairie regions. Easily and often confused with other species. Highly variable and not readily defined. Limb thin and wilting rapidly, much dissected, glabrous. Fronds up to 4 dm long, but variable in size and many sizes often present in the same tuft. Limb pinnate, the pinnae pinnatipartite, the secondary segments ± pinnatifid and serrate. Wooded slopes. -- G-Aka, L-NF, NS, NB-BC, US, CA, Eur, (Afr). -- Var. Huteri (Hausman) Luerssen -- Frond and rachis finely glandular. Rockies. -- (swAlta).

Typically, the spores are covered by spinules readily distinguished with a good microscope. A sporadic form in which the spores are merely rugose has been distinguished as a species, but the rank of form would seem to be more realistic: f. Dickena (Sim) stat. n., C. Dickeana Sim, Gard. Journ. 308. 1848.

2. C. montana (Lam.) Bernh. -- Rather similar to Carpogymnia Dryopteris, but each nerve ending above into an elongate, white fovea. And more dissected, tripinnate, the ultimate segments coarsely lobed to pinnatifid. Slightly scaly-pubescent along the rachises. Damp calcareous habitats. -- G, Mack-Aka, L-NF, Q-O, Alta-BC, US, Eur.

Cystopteris bulbifera (L.) Bernh. has often been reported for south-eastern Manitoba, yet we have found no corresponding specimen in CAN, HUH, MTMG, etc. The only possible justification for its occurence in our area might be a collection by M.W. Hutchinson without locality but bearing the note "Eastern Manitoba, 1944" (MPM; DAO, photo). This generalized distribution is likely to be a verbatim repeat of the entry for the species in the list of Lowe 1943, rather than a place of collection. And the specimen itself is presumably of unknown origin.

8. ATHYRIUM Roth

Sori obviously elongate. Indusia present, elongate, attached laterally and by their whole length. An atypical genus with mostly the technical characters of the Aspleniaceae. One atypical species lacks indusia.

a. Sori and indusia elongate or recurved ... 1. A. Filix-femina
aa. Sori orbicular, indusia lacking ..... 2. A. distentifolium

1. A. Filix-femina (L.) Roth var. Filix-femina (var. Michauxii (Sprengel) Farw.; Asplenium Filix-femina (L.) Bernh.)-- Lady-Fern (Fougère femelle) -- A rather large and much dissected

fern, quite similar to Dryopteris austriaca and readily confused with it when sterile. But the sori about twice as long as broad and the indusia lanceolate. Ultimate nerves not reaching the tip, but usually ending slightly to the side of it (excurrent into spinulose tips in Dryopteris austriaca). Limb bipinnate, the pinnulae deeply lobed. Wet woods. -- G, L-NF-(SPM), NS-Man, US, Eur -- Var sitchense Rupr. (var. cyclosorum (Rupr.) T. Moore) -- Mostly larger, usually 7-15 dm high. Indusia rather short, mostly suborbicular, or deltoid or reniform. -- Mack-Aka, wAlta-BC, (wUS).

The segregation of our plants as an american variety or species is not tenable on a morphological basis. And var. sitchense itself is a rather weak variety.

2. A. distentifolium Tausch var. americanum (Butters) Boivin (A. alpestre (Hoppe) Rylands var. americanum Butters) -- Bipinnate to tripinnatifid frond with small, round, naked sori. Frond 3-6 dm high, ± oblanceolate. Pinnulae lanceolate, 1-2 cm long. Usually one of the marginal lobes is strongly recurved and partly covers the adjacent sorus. Wet cliffs and talus slopes at or below timberline: Waterton. -- (G, Aka, L)-NF, seQ, Alta-BC, wUS.

Var. americanum is based on a series of tendencies and not on a simple morphological discontinuity; its frond is usually narrower, the pinnulae often more remote and the smaller sori usually show no trace of indusia.

9. ASPLENIACEAE (SPLEENWORT FAMILY)

Sori elongate. Indusia similarly elongate and attached laterally by their whole length.

1. ASPLENIUM L. SPLEENWORT

Evergreen ferns, the limb quite dissected.

1. A. viride Hudson -- Small delicate fern, the fronds about 1 dm long, the limb linear, pinnate, the numerous small pinnae subopposite.

Stipe blackish below, with a few hair-like scales. Quite similar to Woodsia glabella, but the latter has the stipe pale green, articulate and coarsely scaly. Limestone cliffs. -- (G), swMack-(Y)-Aka, NS,NB-O, swAlta-BC, (US), Eur.

10. POLYPODIACEAE (POLYPODY FAMILY)

Frond simple, the sori dorsal, rounded and without indusium.

POLYPODIUM L.

Rhizome elongate, the fronds not tufted, coriaceous.

1. P. vulgare L. var. virginianum (L.) Eaton -- Polypody (Tripe de roche) -- Frond simple but pinnatipartite; lobes linear to oblong-lanceolate, not narrowed at base, finely serrate, obtuse or acute at tip. Sori rather coarse, in two paralled rows on the back of each lobe. Abrupt places, mostly acid and rocky,

sometimes forming a dense carpet over rocky outcrops. Precambrian regions. -- sMack-Aka, NF-SPM, NS-eBC, US. -- Var. columbianum Gilbert -- Pinnae slightly narrowed near the base, oblong lanceolate to obovate, more or less rounded at tip. Waterton. -- Alta-sBC.

11. MARSILEACEAE

Fronds dimorphous, the sterile one digitately divided, the fertile one tightly enroled into a pea-sized structure called sporocarp.

1. MARSILEA L.

Sterile fronds divided into 4 terminal leaflets.

1. M. mucronata Braun (M. vestita AA.) -- Looking just about like a four-leaved Clover. Stems elongate, creeping, rooting in the mud, with tufts of rusty hairs at the nodes. Sterile fronds in small fascicles at each node. Stipes inserted directly at the node and bearing only one sporocarp each. Muddy shores and shallow waters. -- S-BC, US.

Sub-division 2. GYMNOPHYTINA CONIFERS

Plants reproducing by seeds borne on the ventral face of open scales. A single class with us.

Class. 5. PINOPSIDA

Seeds two together on a scale. Scales disposed in cones. Resinous woody plants, mostly with persistent leaves. Only one order.

Order 7. CONIFERALES

a. Leaves alternate or in fascicles.
  b. Cone reduced to a single ovule; fruit a one-seeded berry .....12. Taxaceae p. 32
  bb. Cone many-seeded and more or less woody .....13. Pinaceae p. 32
aa. Leaves opposite or verticillate .....14. Cupressaceae p. 36

12. TAXACEAE (YEW FAMILY)

Single genus

1. TAXUS L. YEW

Much like a small Fir or Spruce in general appearance, but the cones reduced to two stamens or a single ovule. Fruit a fleshy one-seeded berry.

a. Trailing shrub; needle with a straight tip...1. T. canadensis
aa. Small tree; needle with tip bent backwards...2. T. brevifolia

1. T. canadensis Marsh. -- Ground-Spruce (Buis de sapin) -- Like a trailing Spruce on the forest floor. Central trunk lacking; branches trailing at base, ascending at tip. Needless linear, 1-2 cm long, subpetiolate, more or less disposed in two ranks, flat, abruptly acuminate into a straight sharp tip. Berry red. Scattered in moist coniferous woods, rare: York Factory, Indian Bay. -- NF-(SPM), NS-Man, US.

The York Factory record (CAN; DAO, photo) is a long way from the rest of the range and has never been confirmed. It is now considered questionable as to location; its specific identification has been repeatedly confirmed.

2. T. brevifolia Nutt, -- A tree, erect and with a good central trunk. Otherwise quite similar to the preceding and not readily distinguished in the herbarium except that the tip of each needle is deflexed backwards at an angle of about 30 degrees. Scattered in moist coniferous woods: Waterton -- (Aka), Alta-BC, US.

13. PINACEAE (PINE FAMILY)

Needles in fascicles or spirally arranged. Scales spirally arranged in the cone.

a. Needless deciduous, alternate on the leading shoots, in tufts of 10-20 on the short side-shoots ..... 2. Larix

aa. Needles persistent.
b. Needles all in fascicles ..... 1. Pinus
bb. Needles all alternate.
c. Needles obviously flattened
d. Needles sessile..... 5. Abies
dd. Needles neatly short-petioled... 4. Pseudotsuga
cc. Needles squarrish ..... 3. Picea

1. PINUS L. PINE

Needles all in fascicles, tightly wrapped together at the base. Scales of the cone rather thick-woody.

a. Needles in 5's.
b. Needles very finely and remotely serrulate ..... 1. P. Strobus
bb. Needles entire.
c. Cone purple ..... 3. P. albicaulis
cc. Cone green or almost entirely so ... 2. P. flexilis
aa. Needles in 2's.
d. Needles usually 10-15 cm long ..... 4. P. resinosa
dd. Needles usually 3-5 cm ..... 5. P. divaricata

1. P. strobus L. -- White Pine (Pin blanc) -- A very tall tree, usually overtopping the forest. Needles in 5's, minutely and remotely denticulate, straight and soft, commonly 5 cm long. Young twigs tomentose. Cones commonly 8-10 cm long. Seeds with a long wing. Scattered in the forest or in dense stands in the dryer sites, especially over nearly bare rock. Southeast. -- NF-(SPM), NS-seMan, US-- Var. monticola (Douglas) Nutt. (P. monticola Douglas) -- Barely distinct. Cones usually longer, at least 10 cm long. Young twigs often less densely pubescent. Rockies. -- Alta-BC, US.

In the field the Eastern and Western White Pine seem almost identical. In the herbarium they are indistinguishable in the absence of cones.

2. P. flexilis James -- Limber Pine -- Needles in 5's but entire, stiffer and falcate. A more middle size, tree with the young twigs becoming glabrous. Cones essentially green, at least 8 cm long. Seeds nearly wingless. Usually as scattered trees among taller species on dry rocky slopes. -- swAlta-BC, US.

3. P. albicaulis Eng. -- A small to depressed alpine or subalpine tree with a smooth bark much like that of Abies. Otherwise quite like P. flexilis. Cones purple and smaller, remaining closed. Open slopes and rocky ridges. Rockies.-- swAlta-BC, US.

4. P. resinosa Aiton -- Red Pine (Pin Rouge) -- Needles very long and in 2's, somewhat stiff, usually 10-15 cm long, usually forming big tufts at the end of branches. Bark breading up in large brownish plates. Cones 4-6 cm long. Dry light soils. Southeast. -- NF, NS-seMan, US.

5. P. divaricata (Aiton) Dumont var. divaricata (P. Banksiana Lamb.) -- Jack Pine (Cyprès) -- Needles shortest, stiff,

in 2's, falcate, mostly 3-5 cm long. Cones persistent, about 4 cm long, ascending, incurved, not spiny. A very common conifer on well drained soils, especially on sand, often in pure formations. General north of the prairies. -- sMack, NS-Alta, US -- Var. latifolia (Eng.) Boivin (P. contorta Douglas var. latifolia Eng.; P. Murrayana AA.) -- Lodgepole Pine (Cyprès) -- Cones straight, more or less reflexed, each scale with a strong dorsal protuberance ending in a small pine. Western Alberta and Cypress Hills. -- Mack-Aka, S-BC, US-- X Var. Musci Boivin -- A polymorphic population intermediate between var. latifolia and the type, presumably of hybrid origin. Cones usually straight, variously divergent and more or less spiny. From lakes Primrose and Hasbala westward across central Alberta. -- Mack, S-Alta.

Pinus divaricata (Aiton) Dumont -- Validated by a reference to an earlier name validly published in the Hortus Kewensis. Antedates by one year P. Banksiana Lamb. in current use.

The report of Pinus ponderosa Douglas for Alberta is based in part on R.G.H. Cormack, Carbondale River, near Lynn Creek Cabin, about 10 miles from B.C. Border, rocky-sandy shore, July 22, 1955 (ALTA; DAO, photo). According to T.C. Brayshaw (verbatim) who visited the spot recently, the original cluster of saplings is now reduced to a single rapidly growing tree. This unique individual is some 40 miles from the nearest member of its species and its habitat is unusual to say the least. Local tradition has it that it was originally seeded in and there seems to be no reason to doubt that this is in no way a spontaneous occurrence. There is also at CAN a specimen labelled Dawson, Missouri River, Alta, June 30, 1881. But the Missouri River is now entirely on the U.S. side of the boundary.

2. LARIX Adanson LARCH

Needles deciduous, pale green and turning yellow in the fall. Branches of two kinds, the leading ones with numerous alternate leaves, the lateral one stubby and ending in a tuft of leaves. Cones erect, persistent.

a. Twigs tomentose, the tomentum persistent .....2. L. Lyallii
aa. Twigs glabrous, or pubescent when young only.
  b. Needles almost 1-2 cm long; scales glabrous ..... 1. L. laricina
  bb. Needles about 3 cm; scales puberulent dorsally ..... 3. L. occidentalis

1. L. laricina (DuRoi) K. Koch -- Tamarack (Epinette rouge) -- A bog species with pale green and very sparse foliage. Twigs glabrous. Needles rounded above, keeled below. Cones 1.5 cm long or less, at first pink or purple, maturing pale green to straw-coloured. Bracts very short and hidden between the glabrous scales. Common in bogs. -- K-Aka, L-SPM, NS-BC, US.

2. L. Lyallii Parl. -- A small tree with densely tomentose branchlets, the tomentum persisting many years after the leaves have fallen off. Branchlets ± drooping. Leaves squarish, that

is keeled above and below, with all four faces deeply concave. Cones 3-5 cm long, the very long bracts protruding between the scales, their tips reflexed. High alpine and forming small bluffs above the general timberline. Rockies. -- Alta-BC, (US).

3. L. occidentalis Nutt. -- A very tall tree with brittle branchlets, at first puberculent, soon glabrous. Leaves about 3 cm long, convex above, keeled below. Cones of middle size. Bracts with long tips protruding between the scales, the latter densely puberulent dorsally. Low montane on wetter soils. Crow's Nest and Kananaskis. -- Alta-BC, US.

3. PICEA Link SPRUCE

Trees with the cones pendent at maturity. Needles squarish, densely and spirally disposed on the branches. Leaves, when falling off, leaving behind strongly protuberent and decurrent stubs. Cones with small bracts hidden between the scales.

a. Cones lanceolate, 3-6 cm long; twigs glabrous to puberulent ..... 1. P. glauca
aa. Cones ovoid, 1.5-2.5 cm long; twigs puberulent ..... 2. P. mariana

1. P. glauca (Moench) Voss. var. glauca (P. canadensis Miller) -- White Spruce (Epinette blanche) -- Twigs glabrous. Needles squarish, sessile, 1.0-1.5 cm long. Cones annual, drooping, pale green. Scales broadly rounded and entire at tip. A straight and common timber species, prefers poor and somewhat acid soils. -- (K)-Mack-Aka, L-NF-(SPM), NS-BC, US -- Var. albertiana (S. Brown) Sarg. (var. Porsildii Raup) -- Variable and more or less intermediate between var. glauca and var. Engelmannii. Twigs glabrous to puberulent. Needles 1.0-2.0 cm long. Scales variable, often varying within the same cone, commonly rounded or obtuse and finely eroded at summit. Cypress Hills and western Alberta. -- (K-Mack)-Y-(Aka), S-BC, (US) -- Var. Engelmannii (Parry) Boivin (P. Engelmannii Parry) -- Twigs puberulent. Needles mostly 1.5-2.0 cm long. Scales truncate to obtuse and erose at tip. A montane to subalpine type in western Alberta. -- Alta-BC, US.

Var. albertiana is somewhat variable and essentially intermediate to the other two varieties. Often it gives the impression of being a hybrid population, but it ranges much beyond the area of overlap of the other two phenotypes.

Older trees will on occasion retain a smooth bark covered with resin-filled blisters reminiscent of Abies. This variation is fairly frequent within the range of var. albertiana and it has been named var. Porsildii.

2. P. mariana (Miller) BSP. -- Black Spruce (Epinette noire) -- A smaller tree with smaller and purple persistent cones. Twigs glandular puberulent. Needles about 1 cm long. Cones commonly persisting through the second season. A common species of poorer and wetter soils, especially in bogs. General north of the prairies. -- (K)-Mack-Aka, L-NF-(SPM), NS-BC, US.

A report of Picea rubra Dietr. by Johnstone 1939 is based on a collection, J. Jeffrey, Oxford House, Sept. 19, 1850 (E; DAO, photo), now revised to P. mariana.

4. PSEUDOTSUGA Carr.

Cones pendant at the tip of the branchlets. Needles flat, short-petioled. Scales very long, very conspicuous, trifid at tip.

1. P. Menziesii (Mirbel) Franco -- (P. taxifolia (Poiret) Britton) -- B.C. Fir, Douglas Fir (Pin Douglas, Pin de la Colombie) -- A giant tree westward, but of more reasonable size with us. Needles with a short but well defined petiole. Bracts about twice as long as the scales. Local at low altitudes in the Rockies, mostly on rocky or gravelly ground. -- swAlta-BC-- F. Alexidis Boivin -- Low, depressed and straggling. Alpine habitats at high altitude in Waterton--swAlta.

Rocky Mountain specimens will often exhibit shorter cones and leaves and may be distinguished as var. glauca (Beissner) Franco. However the range of morphological overlap with the typical variety is too wide and the distinction is not a practical one, unless one is willing to use the place of collection as a primary character for the majority of the specimens.

5. ABIES Miller FIR

Cones erect, the scales deciduous and leaving behind the persistent, stiffly erect axis. Needles flat and sessile; when falling off leaving behind a smooth, round and non-protuberating scar.

1. A. balsamea (L.) Miller var. balsamea -- Balsam, Balsam-Fir (Sapin) -- Bark smooth, with numerous blisters containing a clear resin called balsam. Leaves flat, those of the lower branches usually forming a two-ranked spay and with few, if any, short lines of glaucous stomata above. Main branches commonly in verticils of about 6. Cones purple violet, turning blackish. Fresh woods. --sK, L-NF, NS-seBC, US-- Var. fallax (Eng.) Boivin (A. lasiocarpa (Hooker) Endl.) -- Needles more glaucous, those of the lower part of the foliage with 6-12 glaucous lines of stomata, of which 4-8 lines will run most of the length of the needle. Western Alberta. -- (swMack)- sY-Aka, wAlta-BC, US.

14. CUPRESSACEAE (CYPRESS FAMILY)

Evergreen trees, usually similar to the Pinaceae, but with the leaves and cone scales opposite or verticillate.

a. Trees; cone woody ..... 1. Thuja
aa. Low shrubs; fruit a bluish berry ..... 2. Juniperus

1. THUJA L. ARBOR-VITAE

Cone with opposite woody scales. Trees with more or less flattened twigs of small, closely imbricated, adnate, scaly leaves.

a. All shoots strongly flattened; dorsal and ventral leaves of the lateral shoots broadly obtuse at summit ..... 1. T. occidentalis
aa. Main leading shoots cylindrical; all leaves ± acute at summit ..... 2. T. plicata

1. T. occidentalis L. -- Cedar (Cèdre) -- A small tree. Foliage compact, of strongly flattened sprays. Leaves opposite, in 4 ranks, those of the dorsal rank with a well defined gland, brown or clear green. Cone small, about 1 cm long, of a few opposite woody scales. Wet places and limestone outcrops. Southeastern Manitoba. -- NS-Man, US.

2. T. plicata D. Don -- Cedar (Cèdre) -- A giant tree westward, much smaller with us. Closely resembling the preceeding but the leading terminal shoots not flattened; all leaves more or less acute and the glands indistinct, being of the same color as the rest of the leaf. Moist woods. Rare and local in the Rockies. -- seAka, Alta-BC, US.

2. JUNIPERUS L. JUNIPER

Cone maturing into a bluish berry. Depressed or creeping shrubs with opposite or verticillate leaves.

a. Leaves verticillate in 3's ..... 1. J. communis
aa. Leaves opposite.
b. Creeping shrub .....2. J. horizontalis
bb. Small tree ..... 3. J. scopulorum

1. J. communis L. var. depressa Pursh (var. saxatilis AA.; J. sibirica AA.) -- Ground Juniper (Genèvre, Buis) -- Needles verticillate in 3's. A low shrub, the branches decumbent, ascending at tip, forming round patches. Leaves 7-15 mm long, straight or incurved at base, strongly carinate, with a ventral glaucous band of stomata. Stomatal zone usually less than half as wide as the leaf. Leaf tips spinescent, with a mucro about 0.5 mm long. Local in sandy soil, dry woods or rocky slopes. -- K-Aka, L-NF-(SPM), NS-BC, US -- Var. saxatilis Pallas (var. montana Aiton) -- Branches more closely creeping. Needles smaller, 4-10 mm long, merely acute or short acuminate, the glaucous zone wider, usually at least half as wide as the leaf. Rocky places in alpine and subarctic habitats. -- G, K-Y-(Aka), L-NF-(SPM), NS-PEI, Q-nMan, swAlta-BC, US, Eur.

Some 8 or 10 collections from the upper Mackenzie basin were reported by Raup 1936 as var. montana. We have examined about half of these specimens and revised them all to var. depressa.

2. J. horizontalis Moench (Sabina horizontalis (Moench) Rydb.) -- Creeping Juniper (Savinier) -- A creeping shrub with small opposite leaves, usually forming a compact and elastic carpet. Green or glaucous. Leaves variable, 1-2-(6) mm long, closely imbricated, adnate to nearly free, more or less acute and ending in a slightly mucronulate tip. Eroded dunes and

hillsides, also on rocky exposures. -- K-Aka, (L)-NF-SPM, NS-BC, US.

2 X -- J. Fassettii Boivin (J. scopulorum Sarg. var. patens Fassett) -- Hybrid of J. horizontalis X scopulorum. Commonly 1 mm high, a diffusely branched shrub, sometimes partly decumbent. Leaves acute to mucronulate. Local in the Rockies. -- swAlta-BC, US.

3. J. scopulorum Sarg. -- A small tree, commonly 2-3 mm high, with a well defined central trunk. Otherwise barely distinguishable from J. horizontalis. Leaves acute at tip, rarely mucronulate. Hillsides, especially near watercourses. Rockies, rare. -- swAlta-BC, US.

Sub-division 3. ANGIOPHYTINA FLOWERING PLANTS

Plants with flowers. Ovules borne in closed chambers formed of carpels.

a. Leaves with nervation commonly pinnate or reticulate. Flowers variable, commonly 5-merous, almost never 3-merous. Trees, shrubs or herbs, often with a taproot .....6. Dicopsida
aa. Leaves with parallel nerves. Flowers commonly trimerous, often much reduced. Herbs without a taproot ..... 7. Monopsida part IV

Class 6. DICOPSIDA DICOTS

Flowers commonly 5-merous, or 2-merous, or 4-merous, or the floral parts in variable number, sometimes much reduced in number, almost never 3-merous. Trees, shrubs or herbs, often with a taproot. Vascular tissues forming a cylinder around a central pith. Bark present, more or less developed.

a. Stem woody, perennial, increasing in diameter through a cambium located between the wood and the bark ..... 1. Lignidae
aa. Stem herbaceous, annual, or perennial, the bark poorly developed ..... 2. Herbidae part II

Sub-class 1. LIGNIDAE WOODY DICOTS

Plants perennial, commonly woody, the bark usually well developped. Sometimes herbaceous.

The Lignidae also include a variety of herbaceous groups. These are not included in the key below, but will be found in the key to the Herbidae.

a. Leaves and buds opposite or verticillate.
b. Leaves simple ..... Group 1, p. 39
bb. Leaves compound ..... Group 2, p. 41
aa. Leaves and buds alternate, or sometimes alternate on the leading shoot, but fasciculate on the short shoots.
c. Leaves compound ..... Group 3, p. 41
cc. Leaves simple
d. Climbing vines ..... Group 4, p. 42
dd. Not climbing
e. Leaves entire ..... Group 5, p. 42
ee. Leaves denticulate to more or less deeply lobed ..... Group 6, p. 43

Group 1

Leaves opposite or verticillate, simple.

a. Small and only semi-woody shrubs, 3 dm high or less ..... Group 1-A
aa. Taller and obviously woody.